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AMENDMENT TO THE CLAIMS

Please **AMEND** claims 1, 8, 18, 23, 31, 34, 37, 41, 43, 45.

Please **ADD** claims 48-57.

No new matter has been added. This listing of claims will replace all prior versions, and listings, of claims in the application.

Listing of Claims

1. (Currently amended) An acoustic borehole source for generating elastic waves through an earth formation via a wall comprising:

a first motorized reaction mass positioned along ~~the~~ <u>an</u> axis of a sonde; and

at least two pads, wherein each of said at least two pads are connected to said sonde and said first motorized reaction mass using a plurality of variable angle pushing rods <u>to convert an axial motion into a radial motion</u> so that said <u>at least two</u> pads generate elastic waves through ~~said~~ <u>the</u> earth formation upon activation of said first motorized reaction mass as a result of impact of the pads against the wall;

wherein the impedance of the acoustic borehole source may be controlled using said plurality of variable angle pushing rods.

2. (Previously Presented) The acoustic borehole source of claim 1, further comprising anchoring means to anchor said sonde in said borehole.

3. (Previously Presented) The acoustic borehole source of claim 1, wherein at least two of said pads are used to anchor said sonde in said borehole.

4. (Previously Presented) The acoustic borehole source of claim 1, further comprising a receiver array positioned along said sonde for receiving said elastic waves after said elastic waves have passed through a portion of said formation.

5. (Previously Presented) The acoustic borehole source of claim 1, wherein said plurality of pushing rods are hingedly connected to the first reaction mass and the pads.

6. (Previously Presented) The acoustic borehole source of claim 1, wherein the weight of the motorized reaction masses are designed to accommodate a specific source property, wherein said source property is selected from the group consisting of radiation energy, frequency bandwidth, and resonance frequency.

7. (Previously Presented) The acoustic borehole source of claim 1, wherein the stiffness of the motorized reaction masses are designed to accommodate a specific source property, wherein said source property is selected from the group consisting of radiation energy, frequency bandwidth, and resonance frequency.

8. (Currently amended) An acoustic borehole source for generating elastic waves through an earth formation via a wall comprising:

a first motorized reaction mass and a second motorized reaction mass positioned along ~~the~~ an axis of a sonde;

at least two pads, wherein each of said at least two pads are connected to said first motorized reaction mass and said second motorized reaction mass using a plurality of variable angle pushing rods to convert an axial motion into a radial motion, so that said at least two pads generate elastic waves through ~~said~~ the earth formation upon activation of at least one of said first and second motorized reaction masses as a result of impact of the pads against the wall;

wherein the impedance of the acoustic borehole source may be controlled using said plurality of variable angle pushing rods.

9. (Previously Presented) The acoustic borehole source of claim 8, wherein said first and second motorized reaction masses are connected to opposite ends of each pad using said pushing rods such that said pads move at an angle α relative to said axis.

10. (Previously Presented) The acoustic borehole source of claim 9, further comprising a compression spring connecting said first and second motorized reaction masses.

11. (Previously Presented) The acoustic borehole source of claim 8, comprising at least three pads and a third and fourth motorized reaction masses, wherein at least two of said pads are commonly connected at opposite ends to said first and second motorized reaction masses using a first plurality of pushing rods and wherein at least

one of said pads is connected at opposite ends to said third and fourth motorized reaction masses using a second plurality of pushing rods.

12. (Previously Presented) The acoustic borehole source of claim 8, further comprising anchoring means to anchor said sonde in said borehole.

13. (Previously Presented) The acoustic borehole source of claim 8, wherein at least two of said pads are used to anchor said sonde in said borehole.

14. (Previously Presented) The acoustic borehole source of claim 13, further comprising a receiver array positioned along said sonde for receiving said elastic waves after said elastic waves have passed through a portion of said formation.

15. (Previously Presented) The acoustic borehole source of claim 8, wherein said plurality of pushing rods are hingedly connected to the first reaction mass and the pads.

16. (Previously Presented) The acoustic borehole source of claim 8, wherein the weight of the motorized reaction masses are designed to accommodate a specific source property, wherein said source property is selected from the group consisting of radiation energy, frequency bandwidth, and resonance frequency.

17. (Previously Presented) The acoustic borehole source of claim 8, wherein the stiffness of the motorized reaction masses are designed to accommodate a specific source property, wherein said source property is selected from the group consisting of radiation energy, frequency bandwidth, and resonance frequency.

18. (Currently amended) An acoustic borehole source for generating elastic waves through an earth formation via a wall comprising:

a first motorized reaction mass positioned along ~~the~~ an axis of a borehole;

at least two pads, wherein each of said at least two pads are connected to said first motorized reaction mass and said borehole using a plurality of variable angle pushing rods to convert an axial motion into a radial motion, so that said at least two pads generate elastic waves through ~~said~~ the earth formation upon activation of said first motorized reaction mass as a result of contact of the pads with the wall;

wherein the impedance of the acoustic borehole source may be controlled using said plurality of variable angle pushing rods.

19. (Previously Presented) The acoustic borehole source of claim 18, further comprising a receiver array positioned along said borehole for receiving said elastic waves after said elastic waves have passed through a portion of said formation.

20. (Previously Presented) The acoustic borehole source of claim 18, wherein said plurality of pushing rods are hingedly connected to the first reaction mass and the pads.

21. (Previously Presented) The acoustic borehole source of claim 18, wherein the weight of the motorized reaction masses are designed to accommodate a specific source property, wherein said source property is selected from the group consisting of radiation energy, frequency bandwidth, and resonance frequency.

22. (Previously Presented) The acoustic borehole source of claim 18, wherein the stiffness of the motorized reaction masses are designed to accommodate a specific source property, wherein said source property is selected from the group consisting of radiation energy, frequency bandwidth, and resonance frequency.

23. (Currently amended) An acoustic borehole source for generating elastic waves through an earth formation via a wall comprising:

a first motorized reaction mass and a second motorized reaction mass positioned along ~~the~~ an axis of a borehole;

at least two pads, wherein each of said at least two pads are connected to said first motorized reaction mass and said second motorized reaction mass using a plurality of variable angle pushing rods to convert an axial motion into a radial motion, so that said at least two pads generate elastic waves through ~~said~~ the earth formation upon activation of at least one of said first and second motorized reaction masses as a result of contact of the pads with the wall;

wherein the impedance of the acoustic borehole source may be controlled using said plurality of variable angle pushing rods.

24. (Previously Presented) The acoustic borehole source of claim 23, wherein said first and second motorized reaction masses are connected to opposite ends of each pad so that said pads move at an angle α relative to said axis.

25. (Previously Presented) The acoustic borehole source of claim 24, further comprising a compression spring connecting said first and second motorized reaction masses.

26. (Previously Presented) The acoustic borehole source of claim 23, comprising at least three pads and a third and fourth motorized reaction masses, wherein at least two of said pads are commonly connected at opposite ends to said first and second motorized reaction masses using a first plurality of pushing rods and wherein at least one of said pads is connected at opposite ends to said third and fourth motorized reaction masses using a second plurality of pushing rods.

27. (Previously Presented) The acoustic borehole source of claim 23, further comprising a receiver array positioned along said borehole for receiving said elastic waves after said elastic waves have passed through a portion of said formation.

28. (Previously Presented) The acoustic borehole source of claim 23, wherein said plurality of pushing rods are hingedly connected to the first reaction mass and the pads.

29. (Previously Presented) The acoustic borehole source of claim 23, wherein the weight of the motorized reaction masses are designed to accommodate a specific source property, wherein said source property is selected from the group consisting of radiation energy, frequency bandwidth, and resonance frequency.

30. (Previously Presented) The acoustic borehole source of claim 23, wherein the stiffness of the motorized reaction masses are designed to accommodate a specific source property, wherein said source property is selected from the group consisting of radiation energy, frequency bandwidth, and resonance frequency.

31. (Currently amended) A method of generating elastic waves through an earth formation via a wall comprising:

a. providing a sonde having an acoustic borehole source comprised of a first motorized reaction mass positioned along ~~the~~ an axis of said sonde and at least two pads, wherein each of said at least two pads are connected to said sonde and said first motorized reaction mass using a plurality of variable angle pushing rods so as to convert an axial motion into a radial motion wherein the impedance of the acoustic borehole source may be controlled using said plurality of variable angle pushing rods;
b. anchoring said sonde at a selected position within the borehole;
c. activating said first motorized reaction mass so that at least one of said at least two pads urges against said borehole wall to generate elastic waves into the earth formation as a result of impact of the pad against the wall.

32. (Previously Presented) The method of claim 31, further comprising receiving said elastic waves after said elastic waves have passed through a portion of said formation.

33. (Previously Presented) The method of claim 31, wherein anchoring said sonde comprises urging at least two of said pads against said borehole wall.

34. (Currently amended) A method of generating elastic waves through an earth formation via a wall comprising:

   a. providing a sonde having an acoustic borehole source comprised of a first and a second motorized reaction masses positioned along ~~the~~ an axis of said sonde and at least two pads, wherein each of said at least two pads are connected to said first motorized reaction mass and said second motorized reaction mass using a plurality of variable angle pushing rods so as to convert an axial motion into a radial motion wherein the impedance of the acoustic borehole source may be controlled using said plurality of variable angle pushing rods;
   b. anchoring said sonde at a selected position within the borehole; and
   c. preferentially activating said first or second motorized reaction masses so that at least one of said at least two pads urges against said borehole wall to generate elastic waves into the earth formation as a result of impact of the pad against the wall, wherein direction of the elastic waves is a function of

phase of activation of the first motorized reaction mass relative to the second motorized reaction mass.

35. (Previously Presented) The method of claim 34, further comprising coordinating the activation of said first or second motorized reaction masses so that at least one of said pads urges against said borehole wall at a predetermined angle α relative to the axis of said sonde.

36. (Previously Presented) The method of claim 34, wherein anchoring said sonde comprises urging at least two of said pads against said borehole wall.

37. (Currently amended) A method of generating elastic waves through an earth formation via a wall comprising:

a. providing a sonde having an acoustic borehole source comprised of a first, second, third and fourth motorized reaction masses positioned along ~~the~~ <u>an</u> axis of said sonde and at least three pads, wherein at least two of said pads are commonly connected at opposite ends to said first and second motorized reaction masses using a first plurality of variable angle pushing rods <u>that convert an axial motion into a radial motion</u> and wherein at least one of said pads is connected at opposite ends to said third and fourth motorized reaction masses using a second plurality of variable angle pushing rods <u>that convert an axial motion into a radial motion</u> wherein the impedance of the acoustic

borehole source may be controlled using said plurality of variable angle pushing rods;

b. anchoring said sonde at a selected position within the borehole; and

c. preferentially activating said first, second, third or fourth motorized reaction masses so that at least one of said at least two pads urges against said borehole wall to generate elastic waves through said earth formation as a result of impact of the pad against the wall, wherein direction of the elastic waves is a function of phase of activation of the first, second, third and fourth motorized reaction masses relative to each other.

38. (Previously Presented) The method of claim 37, further comprising receiving said elastic waves after said elastic waves have passed through a portion of said formation.

39. (Previously Presented) The method of claim 37, further comprising coordinating the activation of said first, second, third and fourth motorized reaction masses so that at least one of said pads urges against said borehole wall at a predetermined angle α relative to the axis of said sonde.

40. (Previously Presented) The method of claim 37, wherein anchoring said sonde comprises urging at least two of said pads against said borehole wall.

41. (Currently amended) A method of generating elastic waves through an earth formation comprising:

a. positioning an acoustic borehole source along a borehole wall in the earth formation wherein said acoustic borehole source is comprised of a first motorized reaction mass positioned along ~~the~~ an axis of said borehole wall and at least two pads, wherein each of said at least two pads are connected to said sonde and said first motorized reaction mass using a plurality of variable angle pushing rods to convert an axial motion into a radial motion, wherein the impedance of the acoustic borehole source may be controlled using said plurality of variable angle pushing rods; and

b. activating said first motorized reaction mass so that at least one of said at least two pads urges against said borehole wall to generate elastic waves into the earth formation as a result of impact of the pad against the borehole wall.

42. (Previously Presented) The method of claim 41, further comprising receiving said elastic waves after said elastic waves have passed through a portion of said formation.

43. (Currently amended) A method of generating elastic waves through an earth formation comprising:

a. positioning an acoustic borehole source along a borehole wall in the earth formation wherein said acoustic borehole source is comprised of a first and a second motorized reaction masses positioned along ~~the~~ an axis of said borehole

wall and at least two pads, wherein each of said at least two pads are connected to said first motorized reaction mass and said second motorized reaction mass using a plurality of variable angle pushing rods to convert an axial motion into a radial motion, wherein the impedance of the acoustic borehole source may be controlled using said plurality of variable angle pushing rods; and

b. preferentially activating said first or second motorized reaction masses so that at least one of said at least two pads urges against said borehole wall to generate elastic waves into the earth formation as a result of impact of the pad against the borehole wall, wherein direction of the elastic waves is a function of phase of activation of the first motorized reaction mass relative to the second motorized reaction mass.

44. (Previously Presented) The method of claim 43, further comprising coordinating the activation of said first or second motorized reaction masses so that at least one of said pads urges against said borehole wall at a predetermined angle α relative to the axis of said borehole.

45. (Currently amended) A method of generating elastic waves through an earth formation comprising:

a. positioning an acoustic borehole source along a borehole wall in the earth formation wherein said acoustic borehole source is comprised of a first, second, third and fourth motorized reaction masses positioned along ~~the~~ an axis of said borehole wall and at least three pads, wherein at least two of said pads are

commonly connected at opposite ends to said first and second motorized reaction masses using a first plurality of variable angle pushing rods <u>to convert an axial motion into a radial motion</u> and wherein at least one of said pads is connected at opposite ends to said third and fourth motorized reaction masses using a second plurality of variable angle pushing rods <u>to convert an axial motion into a radial motion,</u> wherein the impedance of the acoustic borehole source may be controlled using said plurality of variable angle pushing rods;

b. anchoring said sonde at a selected position within the borehole <u>wall</u>; and

c. preferentially activating said first, second, third or fourth motorized reaction masses so that at least one of said at least two pads urges against said borehole wall to generate elastic waves through said earth formation as a result of impact of the pad against the <u>borehole</u> wall, wherein direction of the elastic waves is a function of phase of activation of the first, second, third and fourth motorized reaction masses relative to each other.

46. (Previously Presented) The method of claim 45, further comprising receiving said elastic waves after said elastic waves have passed through a portion of said formation.

47. (Previously Presented) The method of claim 45, further comprising coordinating the activation of said first, second, third and fourth motorized reaction masses so that at least one of said pads urges against said borehole wall at a predetermined angle α relative to the axis of said borehole.

48. (New) The acoustic borehole source of claim 1, wherein the impedance of the acoustic borehole source may be controlled using said plurality of variable angle pushing rods such that a first individual variable angle pushing rod and a second individual variable angle pushing rod of said plurality of variable angle pushing rods have an ability to have different angles relative to said axis of said sonde.

49. (New) The acoustic borehole source of claim 8, wherein such that a first individual variable angle pushing rod and a second individual variable angle pushing rod of said plurality of variable angle pushing rods have an ability to have different angles relative to said axis of said sonde.

50. (New) The acoustic borehole source of claim 18, wherein the impedance of the acoustic borehole source may be controlled using said plurality of variable angle pushing rods such that a first individual variable angle pushing rod and a second individual variable angle pushing rod of said plurality of variable angle pushing rods have an ability to have different angles relative to said axis of said borehole.

51. (New) The acoustic borehole source of claim 23, wherein the impedance of the acoustic borehole source may be controlled using said plurality of variable angle pushing rods such that a first individual variable angle pushing rod and a second individual variable angle pushing rod of said plurality of variable angle pushing rods have an ability to have different angles relative to said axis of said borehole.

52. (New) The method of claim 31, wherein the impedance of the acoustic borehole source may be controlled using said plurality of variable angle pushing rods such that a first individual variable angle pushing rod and a second individual variable angle pushing rod of said plurality of variable angle pushing rods have an ability to have different angles relative to said axis of said sonde.

53. (New) The method of claim 34, wherein the impedance of the acoustic borehole source may be controlled using said plurality of variable angle pushing rods such that a first individual variable angle pushing rod and a second individual variable angle pushing rod of said plurality of variable angle pushing rods have an ability to have different angles relative to said axis of said sonde.

54. (New) The method of claim 37, wherein the impedance of the acoustic borehole source may be controlled using said plurality of variable angle pushing rods such that a first individual variable angle pushing rod and a second individual variable angle pushing rod of said plurality of variable angle pushing rods have an ability to have different angles relative to said axis of said sonde.

55. (New) The method of claim 41, wherein the impedance of the acoustic borehole source may be controlled using said plurality of variable angle pushing rods such that a first individual variable angle pushing rod and a second individual variable

angle pushing rod of said plurality of variable angle pushing rods have an ability to have different angles relative to said axis of said borehole wall.

56. (New) The method of claim 43, wherein the impedance of the acoustic borehole source may be controlled using said plurality of variable angle pushing rods such that a first individual variable angle pushing rod and a second individual variable angle pushing rod of said plurality of variable angle pushing rods have an ability to have different angles relative to said axis of said borehole wall.

57. (New) The method of claim 45, wherein the impedance of the acoustic borehole source may be controlled using said plurality of variable angle pushing rods such that a first individual variable angle pushing rod and a second individual variable angle pushing rod of said plurality of variable angle pushing rods have an ability to have different angles relative to said axis of said borehole wall.